A Tale of Two [Univer]Cities: Changing Learning Environments

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This paper outlines case study developments in relation to new learning environments in two universities in Hong Kong, with an emphasis on the context behind these changes, the changes involved, and the mechanisms employed for informing and guiding these changes.

From past to present, the focus of learning has shifted from the search and understanding of information to the application and construction of knowledge (Brown & Long, 2006). The learner-centered paradigm of teaching and learning (e.g. Laurillard 2002 & 2009; Biggs 2003) highlights the importance of engaging students actively in both the manipulation and construction of knowledge. This leads to new interpretations of what constitutes 'good' learning activities, and the process of knowledge acquisition, active learning, interaction and social engagement (Brown & Long 2006).

Learning environments have an important role in coordinating and affording different learning activities (Aimee 2009; Brown & Long 2006; Van Note Chism & Bickford 2002; Van Note Chism 2006; Lomas & Oblinger 2006). With an increased emphasis in interactive and collaborative learning, new designs of environments have been demanded. For example, Bransford, Brown and Cocking (2000) called for new research to review physical learning environments in higher education that facilitate group work and the promotion of interaction between students and students, and students and teachers.

Learning environments in this paper are divided into two categories: physical and virtual. The physical relates to the buildings, the classrooms, the laboratories, the libraries, the cafés; the formal and inform places where student study and learn. Informal learning spaces or ILS refers to the learning environment that is outside formal facilitation by instructors (Hunley & Schaller 2006), for example, open spaces in corridors or outside classrooms. In addition to lectures in classrooms and studying at libraries, students have always engaged in informal learning activities in other parts of the university campus. Students often engage in deep learning through face-to-face discussions in ILS. In previous university designs, these ILS have often focused on student residences, open areas between buildings where students gather, etc (Jamieson, Dane & Lippman 2005). Wolff (2002), however, points out the importance of focusing on other factors in ILS mostly brought about by new technology affordance and that designing the right ILS can make a major difference in supporting a range of learning activities, both individual and group-based.

The virtual learning environment in this paper, relates to places where students get access to online resources, often from the cloud, from online applications or from the learning management systems (LMS). Until relatively recently, the virtual learning environments had little obvious impact on the design of the physical learning environments in traditional research-led universities. Today, with nearing one hundred percent student ownership of computers and mobile phones, which are increasingly 'smart' and the

introduction of thousands of free downloadable applications, social networks, social repositories and social bookmarks, the landscape of the university campus is showing signs of significant change. The use of computers as well as the connection to the Internet has led to immense changes to how we do things in society at large and how we study in universities in particular. University students have been referred to as "the net generation" (Tapscott, 1998) or "digital natives" (Prensky, 2001). This new student cohort, it is argued were brought up "surrounded by … computers, videogames, digital music players and cell phones" (Prensky, 2001; pp. 1). Caruso (2004) conducted a survey across 13 institutions in the USA and found that 93.4% of a total 4374 respondents have their own computer. Among these users, 99.5% of the students used their computers to assist in their studies and in communications between peers and teachers and administrators in the universities.

Digital technology, without doubt, now plays a key role in many higher education institutions around the world and that the use of this technology has a major impact on what is studied as well as how it is studied (Barab, Kling, & Gray, 2004). Browne, Jenkins and Walker (2006) report that as early as 2005, 95% of all higher-education institutions in the UK used an LMS to assist in delivering learning resources, administrative information, assignment and marking repositories, etc. And increasingly, students, use computers to access resources and support, evaluate their learning, carry out both formal and informal learning tasks, communicate between peers and with tutors. Since 2005, we would argue, this crucial role of digital technologies to support learning in higher education has only increased. Barab, Kling, & Gray (2004) identified digital technology impacting on what is studied and how it is studied and we argue that digital technology also must be central to reconceptualizing designs for new physical learning environments to cater for new learning styles and changing needs of students.

In the United Kingdom, the Joint Information Systems Committee (JISC) published a seminal work on advising universities in the design of new buildings and facilities and the retrofit of existing learning spaces, taking into account the growing impact of virtual environments (JISC, 2006). In the same year, the US-based Educause published 'Learning Spaces' (Oblinger, 2006), which evidenced the impact of physical and virtual spaces for learning and later Educause devoted an entire issue of their quarterly magazine to new learning space designs (Educause, 2009). In 2010, the Australian Learning and Teaching Council published a book on designing learning spaces, based on an extensive study of changing needs for physical spaces in universities (Mitchell & White, 2010). Keppell, Souter and Riddle's book (2012) evidenced changes in teaching and learning brought about by new learning environments. Salter, Thomson, Fox and Lam (in press) explored technology-rich learning environments and how these supported new collaborative practices amongst students. What these and other recent publications on learning environments agree is that spaces both physical and virtual have a significant impact on student learning.

In Hong Kong, higher education faces an unique opportunity to benefit from this applied research as it prepares for a fundamental shift to an outcomes-based curriculum, and from a predominantly 3-year to a 4-year degree programme, starting in September 2012.

The new curriculum comes with a massive increase in student numbers. At the two universities in this study, each will gain an extra 3,500 students, creating pressures on existing buildings and the need for retrofitting these buildings to accommodate new needs as well as the development of new buildings.

This paper reports on some of these developments in two research-intensive institutions. The reportage in the paper is structured using the following framework outlined in Figure 1.

Approaches/Spaces	Classroom	Library	Faculty/ college	Informal	Virtual
Expert opinion driven	a.		c.		
Teacher/ administrator driven					e.
User driven/ user evaluated		b.		d.	

Figure 1: Learning environment developments framework

The framework specifies five main types of physical and virtual learning spaces and three approaches used in considering the affordances of these learning spaces, making use of principles and ideas provided by experts, administrators, teachers and students. These approaches are not considered mutually exclusive, with each approach influencing the other in gaining the best understanding of learning space needs and possibilities within specific contexts. The examples in this paper are thus represented with a degree of simplification and with one major approach highlighted in each case to increase clarification. The paper does not aim at providing a comprehensive list of the work carried out relating to learning spaces but showcases a subset of work to illustrate the complexity of matters and to stimulate debate in identifying issues necessary in preparing for the design of new learning spaces and the retrofitting of existing spaces in educational institutions.

Examples taken from the two universities include exploration into the following areas:

a. Expert driven improvements on formal learning spaces

At one university, external experts from overseas were commissioned to identify present and future physical and virtual learning environment needs and uses, the management and culture of support services for those environments and to recommend changes to best align the institution and faculty for the changing curriculum needs, taking into account institutional cultures, technological and pedagogical practices and opportunities created by major building works. One key point arising was a need to consider the creation of a new position to oversee institutional learning environments.

At the other institution, an internal expert group developed guidelines for common standards for future classroom designs and for retrofitting existing classrooms to bring them up to the standards identified. One key component was to create multiple classroom foci, to afford more student-centred activities and support less single teacher-centred work. The designs also included the importance of flexible furniture and flexible learning spaces settings. Some of the key points from this document (Fox & Lam, 2012) on classrooms are outlined below.

- All classrooms need to cater for different teaching and learning practices that support both instructivist and constructivist approaches. In order to cater for multiple practices, classrooms need to be designed that maximize *adaptability* and *flexibility*.
- Learning activities in class can be diverse and the flow from one activity to another can be immediate. Classroom orientation and furniture therefore needs to be capable of quick reconfiguration *during* class (Van Note Chism, 2006).
- Balance needs to be made between locating classrooms in multi-faculty teaching buildings and faculty-located buildings. In planning classroom locations, the University needs to take into account the most efficient use of energy and resources, when, for example, the building or part of the building can be closed during summer vacations. If too many classrooms are located in centrally scheduled teaching blocks, the buildings may be underused during non-teaching times. Multi-faculty buildings may facilitate faster changeover for students between classes.
- General purpose classrooms differ in size, shape and orientation. Larger or smaller classrooms require different designs. For example, classes smaller than 30-seater may not require two doors. Sixty-seater plus classrooms may need more than two access doors. All classrooms need one main (interactive) whiteboard that stretches from wall-to-wall and a 2nd board on a separate wall. All classrooms need double power plugs distributed around the room to enable students to plug in digital devices. All classrooms must have excellent Wifi connectivity, enabling students to use more than one device at the same time linked into the Internet. (Increasingly, we should expect students to use laptops, tablets and smart phones at the same time, requiring at least a Wifi connectively 'X' students x 3 per classroom). All standard classrooms should have access to natural lighting. Furniture in all classrooms should facilitate flexibility and mobility and where appropriate, 'stackability'. All classrooms should display four or more suggested furniture layouts for the desks, chairs and other furniture to afford different types of classroom activities.
- The University requires several 'hi-technology' smart classrooms for teachers and students to experiment with new ways of teaching and learning. To increase flexibility and control in these classrooms, any teacher console (though having a teacher console in classrooms is not essential) should include a portable remote control panel for different projection and other facilities including the lighting control (increasingly this can be carried out using downloadable apps to tablets or smart phones). Facilities should include LCDs and interactive whiteboards on wheels as well as technology such as videoconferencing and other applications as required.

b. User-driven improvements on Library as learning spaces

Both institutions are creating new study spaces for students to support multiple activities including individual and group study needs, quiet and noisy study and technology-rich needs. Each institution is developing very different designs for learning commons to suit the different requirements. In one university, the current student use of library spaces and projected changing student needs was investigated (Lee, Lam, Ho & Fox, 2009). The

outcome of this study was used to inform the planning for the design of new learning commons environments.

Three research strategies were used in this study (ibid, 2009): observation, short interviews, and surveys. During the two-week study, a total of 17,590 occupants and their usages were recorded. A total of 421 users were interviewed, and a total of 540 users were surveyed. The study provided information on four different areas: students' learning activities in the libraries, students' learning preferences, use of technology in the libraries, strengths and weaknesses of the existing library environments.

Concerning learning activities, 81% of the students in the interviews stated that they were completing learning activities in the libraries. Across the library, the information commons, which houses multiple computer workstations had the highest occupancy rates. There were no available seats in individual study carrels and information commons during peak periods. The most common learning activity in the libraries was print-based and online reading (about 60%) (as recorded in observations) and revision/ studying (about 40%) (as reported in interviews). Group work was not common in libraries at that time, suggesting to the researchers that the spaces presently designed did not afford group work and that this type of work was carried out outside the library. However, in more open discussion zones in the library, only about 50% of the students were actually engaged in discussions, the remaining 50% were studying on their own. This, in part, can be attributed to the time of year the study was undertaken, as students were beginning to prepare for forthcoming examinations.

Technology availability was seen as very important by the students. More than half of students (53%) were using computers in libraries and 81.5% of the computer users connected their own computers to the power supply. 83% and 69% of students had used the university Wifi facility in the libraries. Slightly more students preferred using library computers to using their own computers. However, this situation is continually changing with increasingly more students bringing in their own laptops, tablets and smart phones into the library to support their studies.

In this study, we also noted the importance of different zones in the libraries, especially quite zones. For example, the study affirmed that the libraries were heavily used by students leading up to examination times and that therefore any new developments in retrofitting the library should take into account the need to facilitate easy re-purposing of library spaces to accommodate 'seasonal' changes in students needs for learning spaces. It is reasonable to expect that the need for more spaces will increase considerably under the new four-year curriculum, when there will be many more undergraduate students studying on campus and due to the changing curriculum, many more students requiring spaces for collaborative task-based group work.

Amongst the main strengths of the existing libraries, in the eyes of students interviewed in 2009, were 'convenient location', 'quietness', 'availability of resource materials; good varied seating; good technology', spaciousness and variations in spaces to suit different learning needs. One question remains regarding how the libraries can still maintain these

strengths in the face of the changes taking place. For example, how will the availability of electronic resources impact on the use of and the need for printed books and reference materials? Also, how would the libraries provide the quietness zones and at the same time provide increasing areas for 'noisy zones' and zones for other diverse learning activities.

c. Expert opinion driven improvements on faculty environments.

Between May and August, 2012, three of the eight faculties located on the main campus at one of the two universities will move to brand new purpose-built buildings. The remaining five faculties will be given the extra space vacated on the main campus, amounting to between 20-25% additional space for each faculty. The exercise also enables the University to consolidate and centrally regroup facilities to faculty-based buildings. The case study in this category outlines one faculty's plans for taking advantage of the new spaces made available by the expansion and regrouping of University buildings. This case focuses on two new learning areas within one faculty: a new faculty-based learning commons and library and a flexible multi-purpose classroom facility in an adopted and retro-fitted building.

The existing faculty library was designed to meet the needs of the curriculum 30 years ago. However by the 1990s, studies were critiquing the traditional print-oriented libraries. Dowler (1997), for example, noted the need for changes to libraries due to emerging technologies and the expanding digital culture, and remarked that university libraries needed to be converted from a place providing mainly print materials to an integrated learning support centre, connecting worldwide online resources of information and providing much broader student support. This shift to the nature of the library required significant changes to what the library provided, the services offered and the practices of its staff. The application of the virtual private network (VPN) system that enabled students successfully to search for reference information via the internet (Brown, 2007, Smith & Pietraszewski, 2004) without consulting library staff directly increased pressures for change. The opportunity to move the faculty library to a new location gave the added incentive to re-think services and facilities offered. The new place allocated was the University's old Council Chamber, located on the top floor of the adopted faculty building. The room had been purpose-built for formal meetings, with a series of tiered levels, each with fixed tables, bolted to the floor, all facing a raised platform for the Vice Chancellor and senior managers to sit during council meetings. The room housed over 120 seats, arranged in parliamentary style. The redesigned space for the new learning commons included leveling the floor, removal of all fixed furniture, a limited enclosed space for print resources and surrounding glass-walled offices and bookable student rooms, well equipped with technology to facilitate student group work. One key design requirement was an easy secure closure for the print resource materials when library staff were not on duty, but keeping the remaining space in the new learning commons and library open for students, 24/7. All internal walls in the Council Chamber will be removed and with glass walls erected for any internal room, light will flood into the entire space from three sides (north, east and west). A large garden area on the roof, adjacent to the faculty learning commons will enable students and staff to make use of the outdoor facilities for individual and group work. Retractable awnings will enable the outdoor spaces to be used even during wet days. An additional semi-glassed concertina

room will enable part of the learning commons to be used for occasional seminars, allowing the remaining space in the learning commons to be used by students, even during seminars.

The second innovative space designed for the faculty is multiple and adaptable classrooms. The faculty identified a need for a range of various sized seminar rooms and classrooms and open areas for events and exhibitions. An entire floor allocated for this space has been divided into 12 rooms, accommodating between 15 to 40 people in each room. Six of these rooms have concertina retractable walls allowing for rapid re-use of large spaces for larger events and exhibitions. The key concern during the design stage was to ensure the concertina walls selected for the six flexi-rooms have sufficient sound-proofing to prevent sound interference between classrooms. However, a study of both local and international classrooms with similar concertina retractable walls evidenced that sound proofing requirements could easily be met. Furnishings for these rooms have been carefully selected to facilitate fast stacking and storing of tables and chairs when not required in a purpose-built storage room on the same floor. This new adaptable classroom floor and the new faculty learning commons and library will be completed in 2013.

d. User driven improvements on informal learning spaces.

Both institutions have created new informal learning spaces (ILS) for students to use to support their 'out-of-class' academic activities. The ILSs have been fitted with good wifi access and varied seating, table set ups and refreshment facilities.

Both universities have investigated the actual usage of these spaces, established to promote out-of-class studies. At one university in a retro-fitted floor of a building, a variety of seat and table furnishings were placed in different areas or zones. The zones included 14 sofas (10 single and two dual sofas), 14 high chairs with benches for short stay users and 40 seats with tables in a group study zone. There was also an outdoor study area established leading directly from the ILS. Additional double power sockets and high quality wifi facilities were installed throughout the facility. In the evaluation, we studied whether the new installations had been popular with students and whether they had used the space for learning activities. We wanted to investigate the factors and designs that promote learning in the space and provide recommendations for further developments across the University. In a separate study (Fox & Lam, 2012), we identified multiple large spaces in many buildings, which were air-conditioned but unused. These spaces included areas outside lecture theatres, grand building entrances, broad corridors between buildings, etc., we felt would make excellent ILS for students to use. All these spaces needed were tables and chairs, power sockets for laptops and tablets and good wifi access.

The evaluation strategies in this study were divided into two parts: observation and brief interviews. Two researchers paid regular visits (15 visits in total) to the ILS within a four-week period in 2009. In general, we found that the ILS was used well by students and that the students felt that such facilities across the campus would be useful. Although utilization in the morning was not high, there were plenty more users in the afternoon. Moreover, 56% of the students we interviewed remarked that they came to the ILS at

least twice a week. This indicated that the ILS had regular users. The observed activities were mostly related to learning, with 44% of the users involved in group discussions and a further 43% in self-study.

The findings also identified three main reasons for students to use the ILS. First, the ILS was in a convenient location, near their classrooms or near departments they belonged to. Second, the space had a quiet zone for self-study. Third, the ILS offered a convenient meeting place for students to gather. These findings guided future planning of ILS across the campus.

e. Teacher evaluation of virtual learning spaces.

Both institutions have conducted studies to evaluate major learning management systems (LMS) in the market and to identify present and future needs. A teacher/administer-driven approach was a key characteristic of the process undertaken in both institutions.

The following describes the LMS review exercise which was completed in 2010 in one university. An eLearning System Review Panel was formed with representatives from all faculties and key administrators such as director of the teaching and learning centre, representatives from the library and the head of the IT support centre.

Stage one of the review involved the establishment of an evaluation framework to compare and evaluate the two main LMSs (Blackboard vs. Moodle in this case). The four areas agreed upon were 1) functions and usability, 2) technical evaluation, 3) system integration, and 4) total cost analysis. To rate the two systems on these four areas, various evaluation activities were held. For example, a survey given to all teachers was administered to find out what features and functions were most valued in an LMS. The Review Panel test-used the two potential platforms for a prolonged period of time, rated the systems based on pre-set criteria, and then had extended discussions on the strengths and weaknesses of the systems. The Review Panel also met and rated the System Integrators in meetings where each presented proposed services and support in the initial set-up as well as the daily running of the platforms. Student groups were also invited to test and comment on the two systems. A similar arrangement was implemented in the other university at the same time.

Conclusion

It is clear that massive changes regarding the learning environments in the two universities are underway. We are able to make the following generalizations about recent learning space developments in the two universities. Firstly, the changes are informed by recent world-wide trends to reconsider spaces to maximize learning. But more importantly, in our local situation, we recognise the urgency for more learning spaces to support a growth in the student population as the university sector changes from a 3-year to a 4-year curriculum starting September 2012.

We found that demands from students and teachers have influenced our learning space provision and designs as well as the changes being made to the new curriculum. Though traditional teacher-student settings in formal classrooms and lecture theatres

and individual self-study requirements have not changed, there is growth in demands for learning environments that afford collaborative peer learning and social learning places (Boud, Cohen & Sampson, 1990; Van Note Chism, 2006), and technology-rich spaces (Lomas & Oblinger, 2006). Encompassing these ideas into learning space designs, the views towards learning have led to a massive increase in ILS outside formal teaching areas, that facilitate collaborative work (Brown & Long, 2006). Spaces that contain a variety of seating areas and study zones for quite individual study and noisier group study, providing students and teachers with a mix of coffee house style furnishings and refreshments across the universities.

We recognize the importance of understanding the needs of users and soliciting feedback from various stakeholders at various times of development. We identified three ways in which comments were gathered in our developments. We sought opinions and insights from experts and pioneers in the field who also took reference of the latest developments from other parts of the world. More importantly, developments constantly took reference of the needs, user preferences and user habits of students and teachers concerning spaces.

The paper concludes that all of these studies on learning environments, both physical and virtual, are best collated and analysed as one to create the best total learning environment for each university.

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